N-Channel Power MOSFET

FEATURES

- Latest super-junction technology
- Low gate charge capacitance
- High gate noise immunity
- RoHS compliant
- Halogen-free

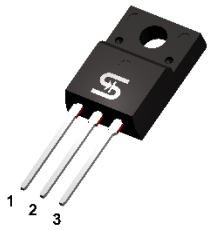
KEY PERFORMANCE PARAMETERS		
PARAMETER	**VALUE**	**UNIT**
V_{DS} @ $T_{j,max}$	650	V
$R_{DS(on)}$ (max)	69	mΩ
$Q_{g,typ}$	89	nC

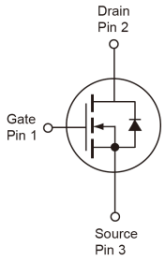
APPLICATIONS

- Switching applications
- HV motor driver
- Industrial

Pb-Free RoHS COMPLIANT HALOGEN FREE

ITO-220TL





ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)				
PARAMETER		**SYMBOL**	**LIMIT**	**UNIT**
Drain-Source Voltage		V_{DS}	600	V
Gate-Source Voltage		V_{GS}	±30	V
Continuous Drain Current	T_C = 25°C	I_D	24	A
Pulsed Drain Current (Note 1)		I_{DM}	96	A
Total Power Dissipation @ T_C = 25°C		P_D	89	W
Single Pulse Avalanche Energy (Note 2)		E_{AS}	840	mJ
Single Pulse Avalanche Current (Note 2)		I_{AS}	5.8	A
Operating Junction and Storage Temperature Range		T_J, T_{STG}	- 55 to +150	°C

THERMAL PERFORMANCE			
PARAMETER	**SYMBOL**	**LIMIT**	**UNIT**
Junction to Case Thermal Resistance	$R_{\Theta JC}$	1.4	°C/W
Junction to Ambient Thermal Resistance (Note 3)	$R_{\Theta JA}$	65	°C/W

Notes:

1. Pulse Width ≤ 100μs.
2. L = 50mH, R_G = 25Ω, Starting T_J = 25°C.
3. $R_{\Theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistances. $R_{\Theta JA}$ is guaranteed by design while $R_{\Theta JA}$ is determined by the user's board design.

ELECTRICAL SPECIFICATIONS (T_A = 25°C unless otherwise noted)						
PARAMETER	**CONDITIONS**	**SYMBOL**	**MIN**	**TYP**	**MAX**	**UNIT**
Static (Note 4)						
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 1mA	BV_{DSS}	600	--	--	V
Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 3.5mA	$V_{GS(TH)}$	4	4.8	6	V
Gate Body Leakage	V_{GS} = ±30V, V_{DS} = 0V	I_{GSS}	--	--	±100	nA
Zero Gate Voltage Drain Current	V_{DS} = 600V, V_{GS} = 0V	I_{DSS}	--	--	100	μA
Drain-Source On-State Resistance	V_{GS} = 12V, I_D = 8A	$R_{DS(on)}$	--	50	60	mΩ
	V_{GS} = 10V, I_D = 8A		--	52	69	
Dynamic (Note 5)						
Total Gate Charge	V_{DS} = 480V, I_D = 24A, V_{GS} = 10V	Q_g	--	89	--	nC
Gate-Source Charge		Q_{gs}	--	23	--	
Gate-Drain Charge		Q_{gd}	--	50	--	
Input Capacitance	V_{DS} = 300V, V_{GS} = 0V, f = 100kHz	C_{iss}	--	3551	--	pF
Output Capacitance		C_{oss}	--	96	--	
Reverse Transfer Capacitance		C_{rss}	--	12	--	
Gate Resistance	f = 1.0MHz	R_g	--	1	--	Ω
Switching (Note 6)						
Turn-On Delay Time	V_{DD} = 300V, R_G = 3.3Ω, I_D = 24A, V_{GS} = 10V	$t_{d(on)}$	--	37	--	ns
Turn-On Rise Time		t_r	--	59	--	
Turn-Off Delay Time		$t_{d(off)}$	--	74	--	
Turn-Off Fall Time		t_f	--	4.4	--	
Source-Drain Diode						
Forward Voltage (Note 4)	I_S = 8A, V_{GS} = 0V	V_{SD}	--	0.8	1.5	V
Reverse Recovery Time	I_S = 12A, dI_F/dt = 100A/μs	t_{rr}	--	349	--	ns
Reverse Recovery Charge		Q_{rr}	--	6.1	--	μC

Notes:

4. Pulse test: Pulse Width ≤ 300μs, duty cycle ≤ 2%.
5. Defined by design. Not subject to production test.
6. Switching time is essentially independent of operating temperature.

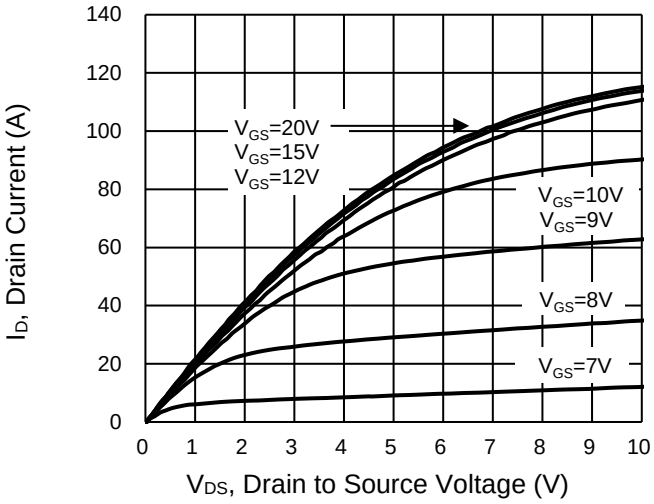
ORDERING INFORMATION

ORDERING CODE	PACKAGE	PACKING
TSM60NE069CIT C0G	ITO-220TL	50pcs / Tube

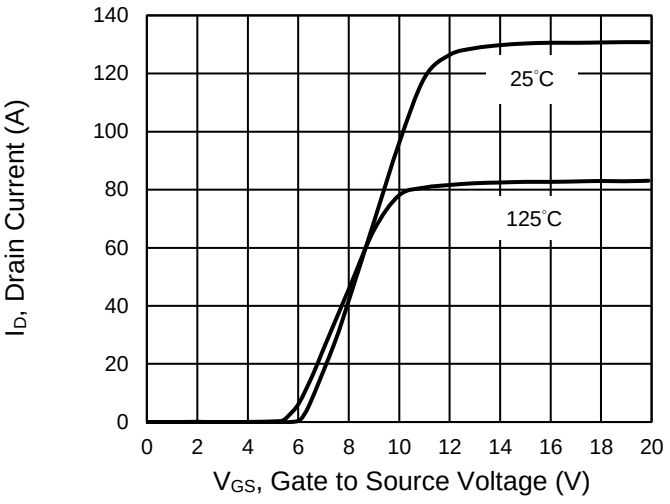
CHARACTERISTICS CURVES

(T_C = 25°C unless otherwise noted)

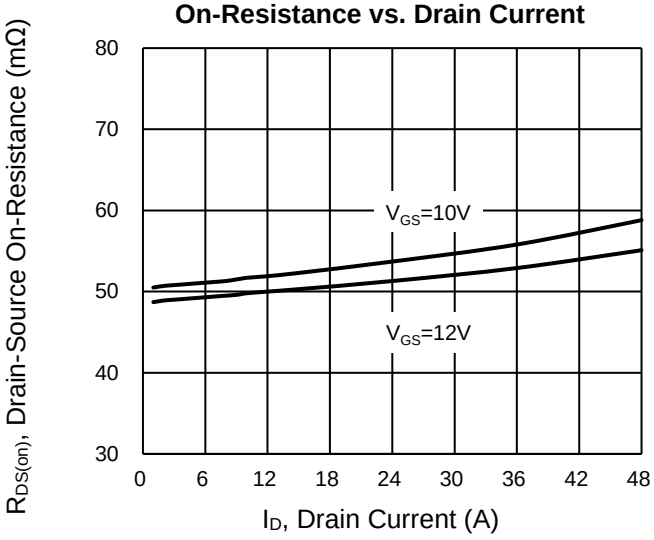
Output Characteristics



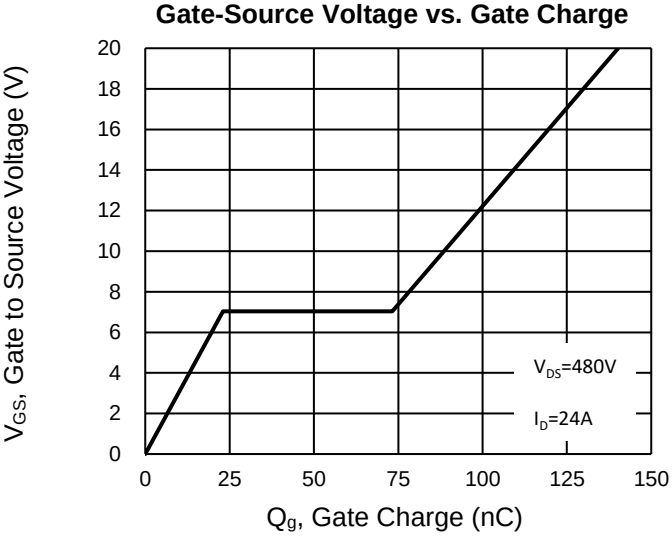
Transfer Characteristics



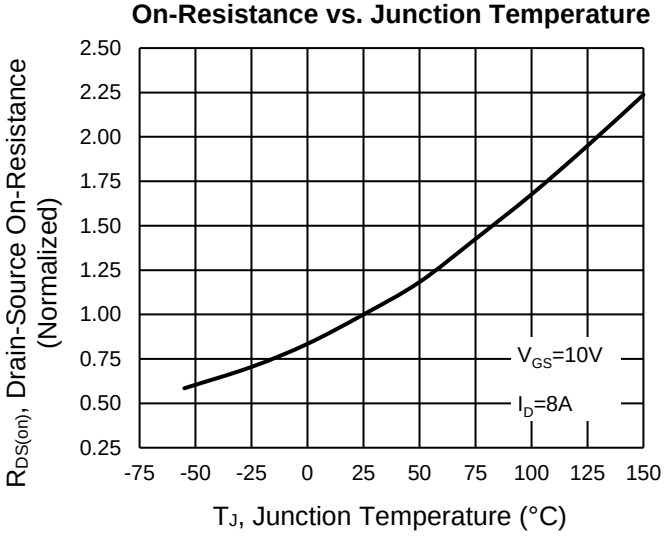
On-Resistance vs. Drain Current



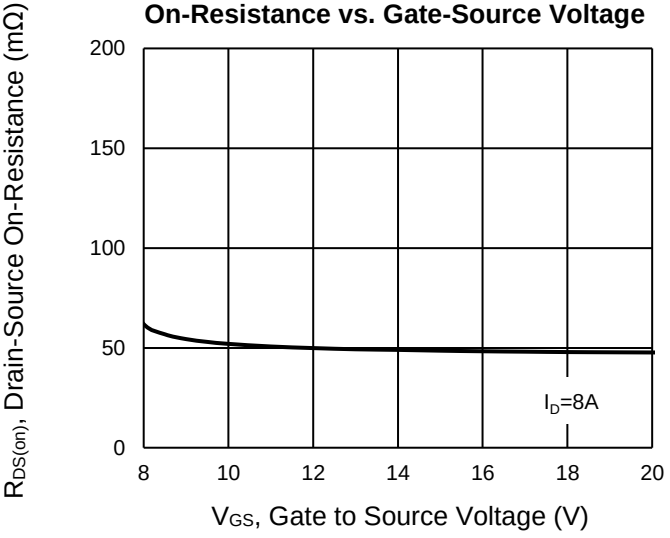
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature



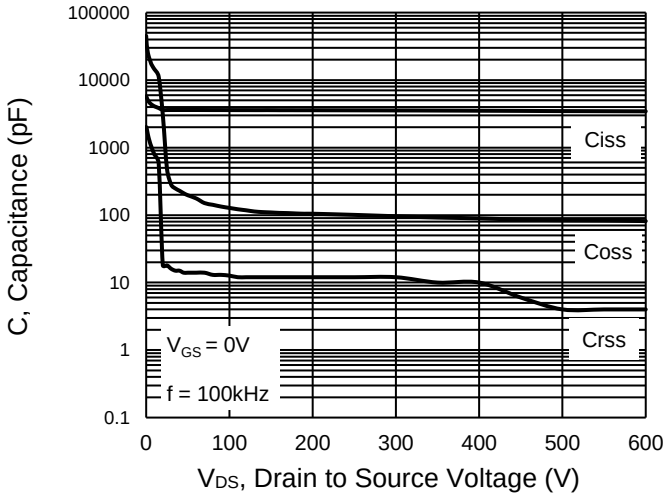
On-Resistance vs. Gate-Source Voltage



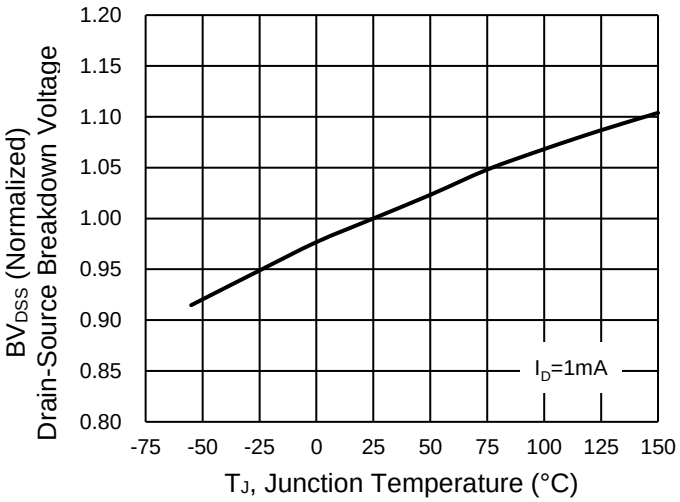
CHARACTERISTICS CURVES

(T_C = 25°C unless otherwise noted)

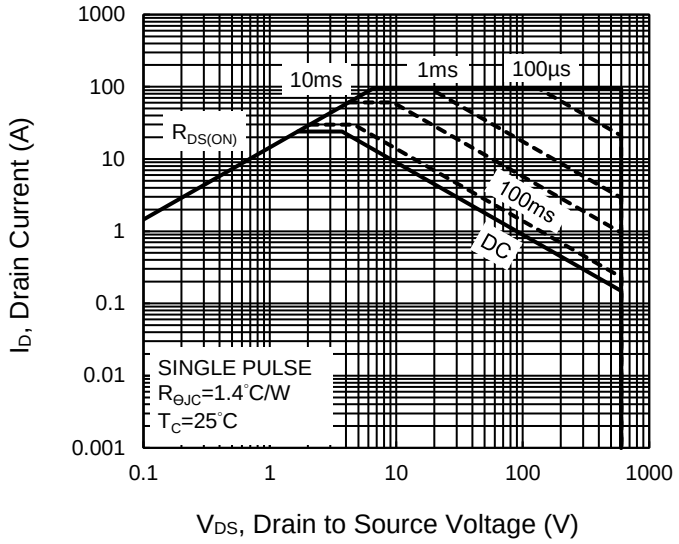
Capacitance vs. Drain-Source Voltage



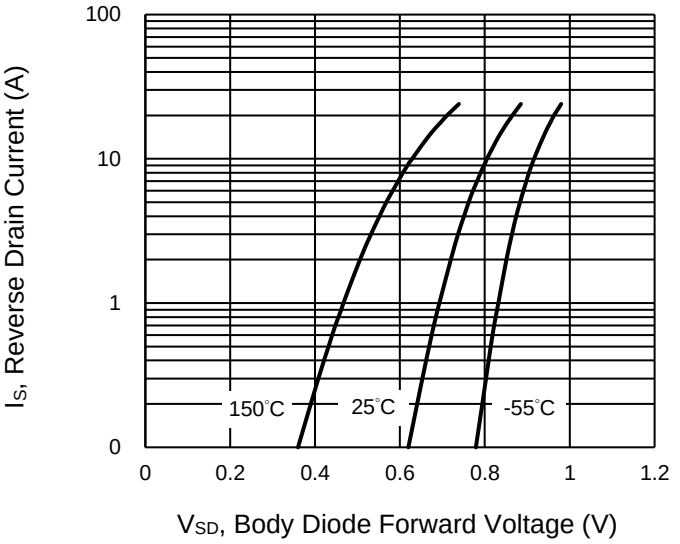
BV_{DSS} vs. Junction Temperature



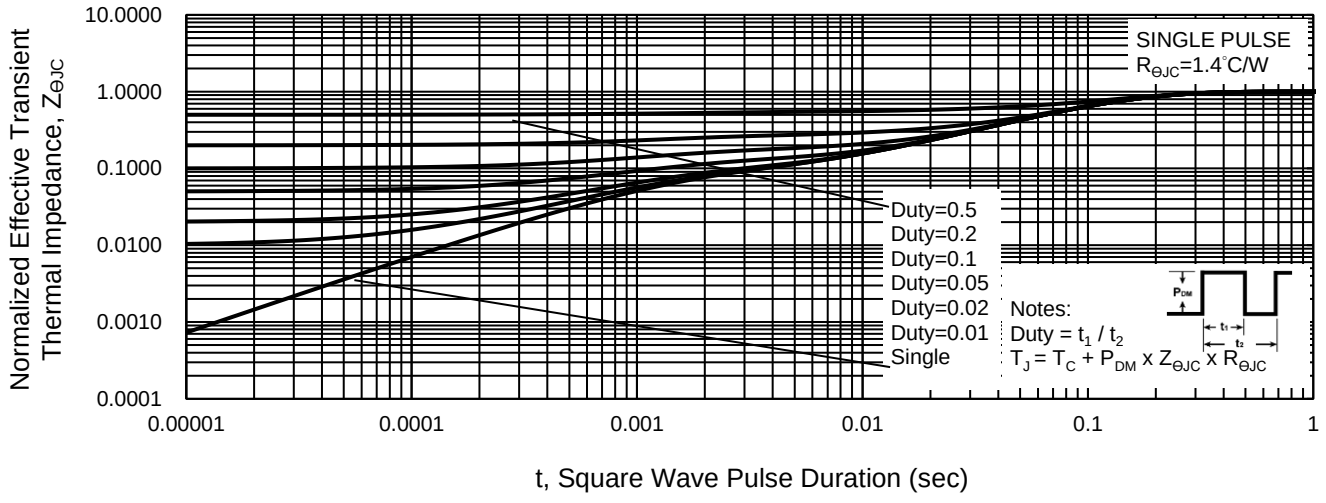
Maximum Safe Operating Area, Junction-to-Case



Source-Drain Diode Forward Current vs. Voltage



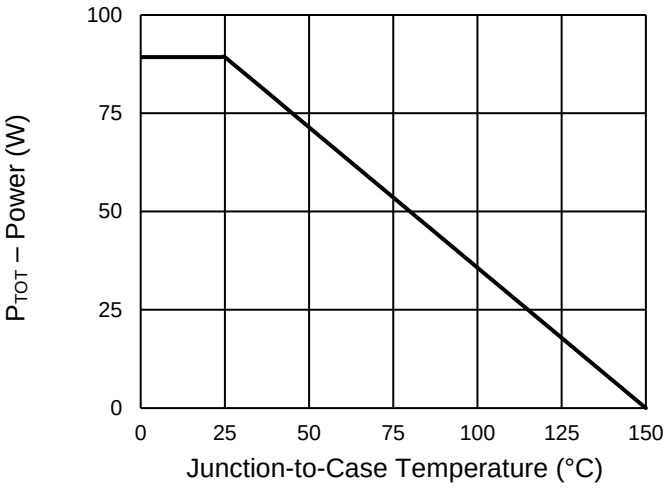
Normalized Thermal Transient Impedance, Junction-to-Case



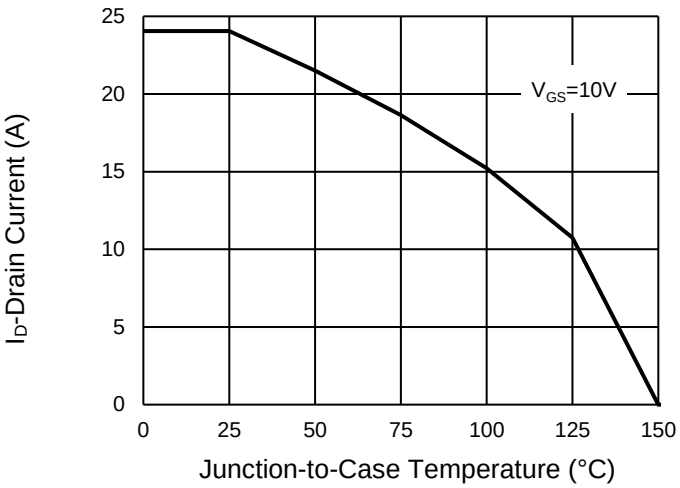
CHARACTERISTICS CURVES

(T_C = 25°C unless otherwise noted)

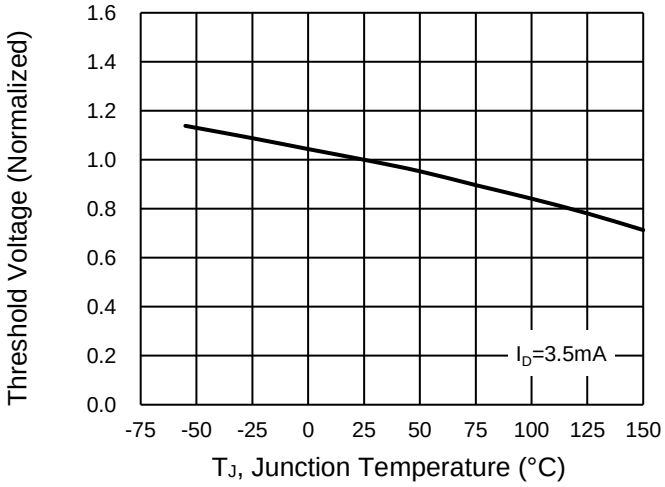
Power Dissipation



Drain Current

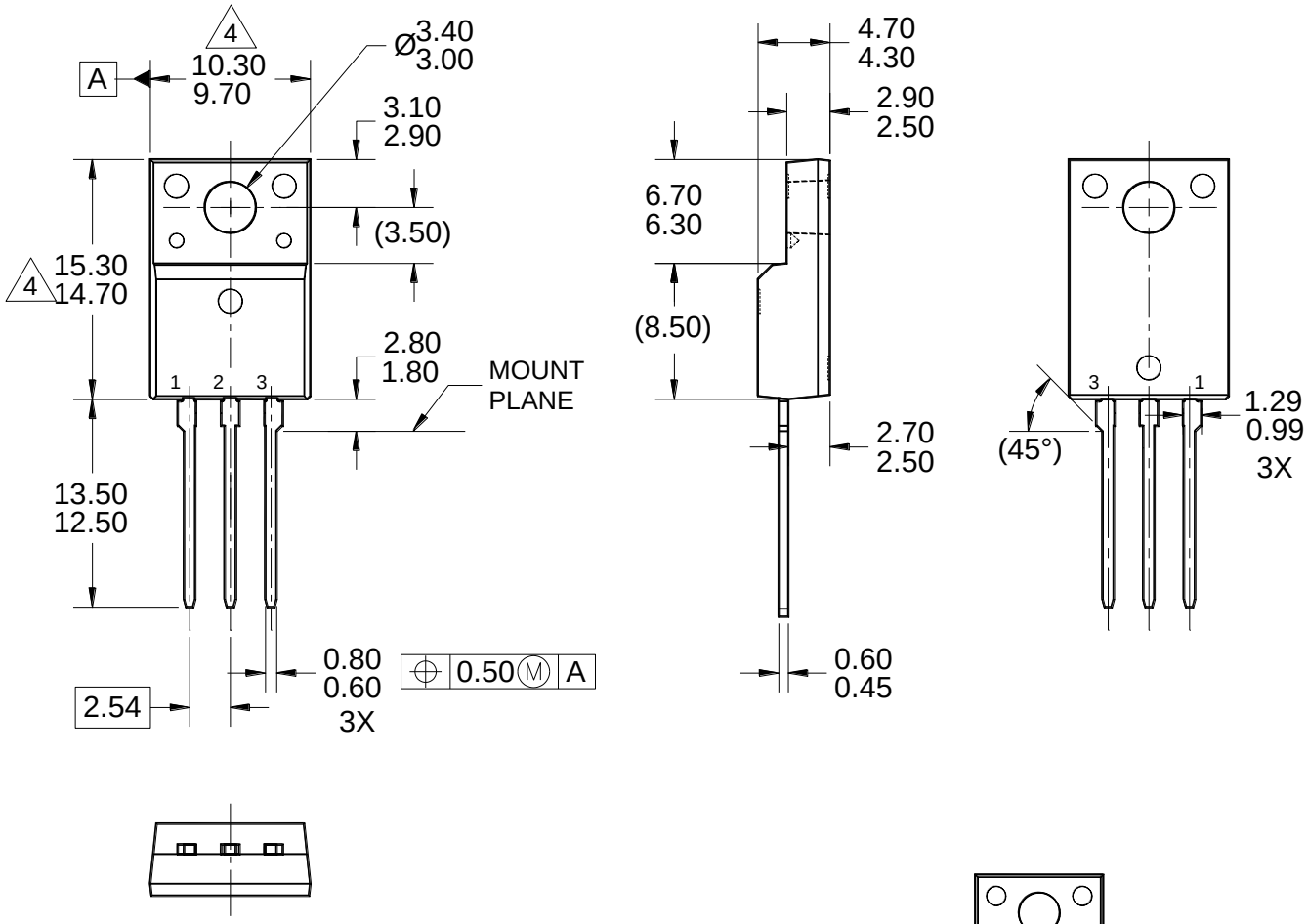


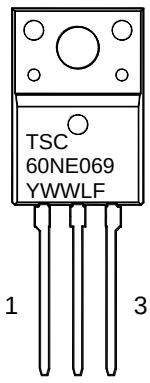
Normalized gate threshold voltage vs Temperature



PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

ITO-220TL





MARKING DIAGRAM

NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
3. PACKAGE OUTLINE REFERENCE: EIAJ ED-7500A-1, SC-91.
4. MOLDED PLASTIC BODY DIMENSIONS DO NOT INCLUDE MOLD FLASH. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREME OF THE PLASTIC BODY.
5. DWG NO. REF: HQ2SD07-ITO220TL-016 REV B.

Y	= YEAR CODE
WW	= WEEK CODE (01~52)
L	= LOT CODE (1~9, A~Z)
F	= FACTORY CODE

Notice

Specifications of the products displayed herein are subject to change without notice. TSC or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies.

Purchasers are solely responsible for the choice, selection, and use of TSC products and TSC assumes no liability for application assistance or the design of Purchasers' products.

Information contained herein is intended to provide a product description only. No license, express or implied, to any intellectual property rights is granted by this document. Except as provided in TSC's terms and conditions of sale for such products, TSC assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of TSC products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify TSC for any damages resulting from such improper use or sale.